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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/672,019 | 09/26/2003 | Yehiel Gotkis | LAM2P437 | 7682 |

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MARTINE & PENILLA, LLP
710 LAKEWAY DRIVE
SUITE 200
SUNNYVALE, CA 94085

| EXAMINER | |
|---|---|
| JAGAN, MIRELLYS | |
| **ART UNIT** | **PAPER NUMBER** |
| 2859 | |

DATE MAILED: 12/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/672,019 | GOTKIS ET AL. | |
| | Examiner | Art Unit | |
| | Mirellys Jagan | 2859 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-21 is/are pending in the application.

4a) Of the above claim(s) 1-12 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 13-18 is/are rejected.

7)☒ Claim(s) 19-21 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 26 September 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

   I. Claims 1-6, drawn to a method of measuring a metal film thickness by measuring temperature, classified in class 374, subclass 7.

   II. Claims 7-12, drawn to a method pf measuring a film thickness by measuring heat transfer rate, classified in class 374, subclass 7.

   III. Claims 13-21, drawn to a chemical mechanical planarization system, classified in class 451, subclass 5.

2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions are not disclosed as capable of use together and they have different modes of operation since Invention I obtains a temperature measurement for determining the thickness and Invention II obtains a heat transfer rate measurement for determining the thickness, wherein a temperature and heat transfer rate measurement are not disclosed as being used together for determining the thickness.

Inventions I and III are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice

another and materially different process. (MPEP § 806.05(e)). In this case, the process as claimed can be practiced by another materially different apparatus, such as an apparatus other than the claimed CMP system.

Inventions II and III are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case, the process as claimed can be practiced by another materially different apparatus, such as an apparatus other than the claimed CMP system.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Mr. Michael Gencarella on December 7, 2004 a provisional election was made without traverse to prosecute Invention III, claims 13-21. Affirmation of this election must be made by applicant in replying to this Office action. Claims 1-12 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the

application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

### *Claim Objections*

6. Claim 19-21 are objected to because of the following informalities:

Claim 13 (see line 3) claims the embodiment shown in figure 2C, which has a wafer carrier that includes the sensor (106) (and the heater (102)). Therefore, claim 19 is objected to since it claims that the heater (102) is positioned on an opposing side of the substrate from the sensor (106), as shown in figures 1, 2A, 2B. Since claims 19-21 are drawn to a species that is different from the species of independent claim 13, claims 19-21 have not been further considered by the examiner.

### *Claim Rejections - 35 USC § 103*

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 13-16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,748,317 to Maris et al [hereinafter Maris] in view of U.S. Patent 6,426,232 to Litvak.

Maris discloses an optical system for measuring the thickness of a metal layer on a wafer, the system comprising:

a sensor configured to detect heat energy;

an impulse heater for delivering a defined heat energy pulse to the layer;

a computing device in communication with the sensor, the computing device configured to calculate a thickness of the layer based upon the detected heat energy in relation to the defined heat pulse;

wherein the heat energy is provided by a YAG laser, which is in the IR range, and the sensor is an IR sensor, since it senses the IR heat energy; and the sensor is positioned to detect the heat energy in a location different from where the heater delivers the pulse to the layer; and the computing device is configured to calculate a heat transfer rate from values associated with the detected energy and the pulse (see column 5, lines 62-65; column 6, lines 42-63; column 7, lines 4-19 and 38-45; column 10, line 48-column 11, line 12; column 11, lines 42-56; column 12, lines 24-28, 42-60; column 13, lines 1-6; and column 15, lines 61-67).

Maris does not disclose the system being used in a wafer carrier configured to support the wafer during a planarization process in a CMP system.

Litvak discloses a system for monitoring the thickness of a metal layer on a wafer that is treated in a CMP system. The CMP system comprises a wafer carrier that supports the wafer during a planarization process in the system. The wafer carrier has an optical system for measuring the thickness of the metal layer on the wafer during the planarization process. Litvak teaches that it is beneficial to use an optical system to monitor the thickness of a metal layer on a wafer during a planarization process in order to accurately detect an endpoint of a layer removal operation (see column 1, lines 28-40; column 5, lines 4-12; column 10, line 17-column 11, line 3; and column 12, lines 29-51).

Referring to claim 13, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Maris by placing the optical thickness-measuring system in a wafer carrier of a CMP, as taught by Litvak, in order to accurately detect the endpoint of a layer removal operation on the wafer during a planarization process.

9. Claims 13 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 54,513,384 to Rosencwaig in view of Litvak.

Rosencwaig discloses an optical system for measuring the thickness of a layer on a substrate, the system comprising:

a sensor (44) configured to detect heat energy;

an impulse heater (32) for delivering a defined heat energy pulse to the layer;

a computing device (50) in communication with the sensor, the computing device configured to calculate a thickness of the layer based upon the detected heat energy in relation to the defined heat pulse; wherein the device has means for storing a curve relating the heat pulse and the detected energy to the thickness (see figure 4; see column 3, lines 36-41; column 4, lines 3-27; column 5, line 51-column 6, line 5; column 6, lines 24-44; and column 6, line 63-column 7, line 4).

Rosencwaig does not disclose the system being used in a wafer carrier configured to support the wafer during a planarization process in a CMP system.

Litvak discloses a system for monitoring the thickness of a metal layer on a wafer that is treated in a CMP system. The CMP system comprises a wafer carrier that supports the wafer

during a planarization process in the system. The wafer carrier has an optical system for measuring the thickness of the metal layer on the wafer during the planarization process. Litvak teaches that it is beneficial to use an optical system to monitor the thickness of a metal layer on a wafer during a planarization process in order to accurately detect an endpoint of a layer removal operation (see column 1, lines 28-40; column 5, lines 4-12; column 10, line 17-column 11, line 3; and column 12, lines 29-51).

Referring to claim 13, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Rosencwaig by placing the optical thickness-measuring system in a wafer carrier of a CMP, as taught by Litvak, in order to accurately detect the endpoint of a layer removal operation on the wafer during a planarization process.

***Conclusion***

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patents and publications disclose measuring the thickness of a layer on a wafer:

U.S. Patent 3,413,474 to Freeh

U.S. Patent 6,654,132 to Schietinger et al

U.S. Patent 6,108,091 to Pecen et al

U.S. Patent 5,258,824 to Carlson et al

U.S. Patent 6,488,568 to Treur et al

U.S. Patent 5,166,080 to Schietinger et al

U.S. Patent 6,464,561 to Sandhu et al

U.S. Patent 6,000,844 to Cramer et al

U.S. Patent 6,069,703 to Banet et al

U.S. Patent 5,377,126 to Flik et al

U.S. Patent Application Publication 2003/0008600 to Ide

U.S. Patent Application Publication 2004/0203328 to Tada et al

U.S. Patent Application Publication 2002/0031164 to Scheidt et al

The following patent discloses a CMP system:

U.S. Patent Application Publication 2004/0033761 to Ono et al

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mirellys Jagan whose telephone number is 571-272-2247. The examiner can normally be reached on Monday-Friday from 11AM to 5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on 571-272-2245. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MJ
December 9, 2004

**Diego Gutierrez**
**Supervisory Patent Examiner**
**Technology Center 2800**

CHRISTOPHER W. FULTON
PRIMARY EXAMINER